

Seventh Grade Science Standards



Dr. Jennifer McCormick
Superintendent of Public Instruction

Working Together for Student Success

Science and Engineering Process Standards (SEPS)		Content Connectors
SEPS.1 Posing questions (for science) and defining problems (for engineering)	A practice of science is posing and refining questions that lead to descriptions and explanations of how the natural and designed world(s) work and these questions can be scientifically tested. Engineering questions clarify problems to determine criteria for possible solutions and identify constraints to solve problems about the designed world.	A practice of science is posing and refining questions that lead to descriptions and explanations of how the natural and designed world(s) work and these questions can be scientifically tested. Engineering questions clarify problems to determine criteria for possible solutions and identify constraints to solve problems about the designed world.

Science and Engineering Process Standards (SEPS)		Content Connectors
SEPS.2 Developing and using models and tools	<p>A practice of both science and engineering is to use and construct conceptual models that illustrate ideas and explanations. Models are used to develop questions, predictions and explanations; analyze and identify flaws in systems; build and revise scientific explanations and proposed engineered systems; and communicate ideas. Measurements and observations are used to revise and improve models and designs. Models include, but are not limited to: diagrams, drawings, physical replicas, mathematical representations, analogies, and other technological models.</p>	<p>A practice of both science and engineering is to use and construct conceptual models that illustrate ideas and explanations. Models are used to develop questions, predictions and explanations; analyze and identify flaws in systems; build and revise scientific explanations and proposed engineered systems; and communicate ideas. Measurements and observations are used to revise and improve models and designs. Models include, but are not limited to: diagrams, drawings, physical replicas, mathematical representations, analogies, and other technological models.</p>
	<p>Another practice of both science and engineering is to identify and correctly use tools to construct, obtain, and evaluate questions and problems. Utilize appropriate tools while identifying their limitations. Tools include, but are not limited to: pencil and paper, models, ruler, a protractor, a calculator, laboratory equipment, safety gear, a spreadsheet, experiment data collection software, and other technological tools.</p>	<p>Another practice of both science and engineering is to identify and correctly use tools to construct, obtain, and evaluate questions and problems. Utilize appropriate tools while identifying their limitations. Tools include, but are not limited to: pencil and paper, models, ruler, a protractor, a calculator, laboratory equipment, safety gear, a spreadsheet, experiment data collection software, and other technological tools.</p>

Science and Engineering Process Standards (SEPS)		Content Connectors
SEPS.3 Constructing and performing investigations	Scientists and engineers are constructing and performing investigations in the field or laboratory, working collaboratively as well as individually. Researching analogous problems in order to gain insight into possible solutions allows them to make conjectures about the form and meaning of the solution. A plan to a solution pathway is developed prior to constructing and performing investigations. Constructing investigations systematically encompasses identified variables and parameters generating quality data. While performing, scientists and engineers monitor and record progress. After performing, they evaluate to make changes to modify and repeat the investigation if necessary.	Scientists and engineers are constructing and performing investigations in the field or laboratory, working collaboratively as well as individually. Researching analogous problems in order to gain insight into possible solutions allows them to make conjectures about the form and meaning of the solution. A plan to a solution pathway is developed prior to constructing and performing investigations. Constructing investigations systematically encompasses identified variables and parameters generating quality data. While performing, scientists and engineers monitor and record progress. After performing, they evaluate to make changes to modify and repeat the investigation if necessary.
SEPS.4 Analyzing and interpreting data	Investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists and engineers use a range of tools to identify the significant features in the data. They identify sources of error in the investigations and calculate the degree of certainty in the results. Advances in science and engineering makes analysis of proposed solutions more efficient and effective. They analyze their results by continually asking themselves questions; possible questions may be, but are not limited to: "Does this make sense?" "Could my results be duplicated?" and/or "Does the design solve the problem with the given constraints?"	Investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists and engineers use a range of tools to identify the significant features in the data. They identify sources of error in the investigations and calculate the degree of certainty in the results. Advances in science and engineering makes analysis of proposed solutions more efficient and effective. They analyze their results by continually asking themselves questions; possible questions may be, but are not limited to: "Does this make sense?" "Could my results be duplicated?" and/or "Does the design solve the problem with the given constraints?"

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Science and Engineering Process Standards (SEPS)		Content Connectors
SEPS.5 Using mathematics and computational thinking	In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Scientists and engineers understand how mathematical ideas interconnect and build on one another to produce a coherent whole.	In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Scientists and engineers understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
SEPS.6 Constructing explanations (for science) and designing solutions (for engineering)	Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it, and are consistent with the available evidence.	Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it, and are consistent with the available evidence.

Science and Engineering Process Standards (SEPS)		Content Connectors
SEPS.7 Engaging in argument from evidence	<p>Scientists and engineers use reasoning and argument based on evidence to identify the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation, the process by which evidence-based conclusions and solutions are reached, to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to evaluate claims.</p>	<p>Scientists and engineers use reasoning and argument based on evidence to identify the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation, the process by which evidence-based conclusions and solutions are reached, to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to evaluate claims.</p>
SEPS.8 Obtaining, evaluating, and communicating information	<p>Scientists and engineers need to be communicating clearly and articulating the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations, as well as, orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.</p>	<p>Scientists and engineers need to be communicating clearly and articulating the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations, as well as, orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.</p>

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Physical Science (PS)	Content Connector
7.PS.1 Draw, construct models, or use animations to differentiate between atoms, elements, molecules, and compounds.	7.PS.1.a.1 Draw, construct models, or use animations to differentiate between atoms, elements, molecules, and compounds.
7.PS.2 Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.	7.PS.2.a.1 Describe the properties of solids, liquids, and gases.
	7.PS.2.a.2 Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.
7.PS.3 Investigate the Law of Conservation of Mass by measuring and comparing the mass of a substance before and after a change of state.	7.PS.3.a.1 Investigate the Law of Conservation of Mass by measuring and comparing the mass of a substance before and after a change of state.
7.PS.4 Investigate Newton's first law of motion (Law of Inertia) and how different forces (gravity, friction, push and pull) affect the velocity of an object.	7.PS.4.a.1 Investigate Newton's first law of motion (Law of Inertia) and how different forces (gravity, friction, push and pull) affect the velocity of an object.
7.PS.5 Investigate Newton's second law of motion to show the relationship among force, mass and acceleration.	7.PS.5.a.1 Investigate Newton's second law of motion to show the relationship among force, mass and acceleration.
7.PS.6 Investigate Newton's third law of motion to show the relationship between action and reaction forces.	7.PS.6.a.1 Investigate Newton's third law of motion to show the relationship between action and reaction forces.
7.PS.7 Construct a device that uses one or more of Newton's laws of motion. Explain how motion, acceleration, force, and mass are affecting the device.	7.PS.7.a.1 Construct a device that uses one or more of Newton's laws of motion.
	7.PS.7.a.2 Explain how motion, acceleration, force, and mass are affecting the device.
7.PS.8 Investigate a process in which energy is transferred from one form to another and provide evidence that the total amount of energy does not change during the transfer when the system is closed. (Law of conservation of energy)	7.PS.8.a.1 Investigate a process in which energy is transferred from one form to another and provide evidence that the total amount of energy does not change during the transfer when the system is closed. (Law of conservation of energy)
7.PS.9 Compare and contrast the three types of heat transfer: radiation, convection, and conduction.	7.PS.9.a.1 Compare and contrast the three types of heat transfer: radiation, convection, and conduction.

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Earth and Space Science (ESS)	Content Connector
7.ESS.1 Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	7.EES.1.a.1 Identify and investigate the properties of minerals.
	7.ESS.1.a.2 Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)
7.ESS.2 Construct a model or scale drawing (digitally or on paper), based on evidence from rock strata and fossil records, for how the geologic time scale is used to organize Earth's 4.6 billion-year-old history.	7.ESS.2.a.1 Construct a model or scale drawing (digitally or on paper), based on evidence from rock strata and fossil records, for how the geologic time scale is used to organize Earth's 4.6 billion-year-old history.
7.ESS.3 Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.	7.ESS.3.a.1 Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.
7.ESS.4 Construct an explanation, based on evidence found in and around Indiana, for how large scale physical processes, such as Karst topography and glaciation, have shaped the land.	7.ESS.4.a.1 Construct an explanation, based on evidence found in and around Indiana, for how large scale physical processes, such as Karst topography and glaciation, have shaped the land.
7.ESS.5 Construct a model, diagram, or scale drawing of the interior layers of the Earth. Identify and compare the compositional (chemical) layers to the mechanical (physical) layers of the Earth's interior including magnetic properties.	7.ESS.5.a.1 Identify and compare the compositional (chemical) layers to the mechanical (physical) layers of the Earth's interior including magnetic properties.
7.ESS.6 Research common synthetic materials (i.e. plastics, composites, polyester, and alloys) to gain an understanding that synthetic materials do come from natural resources and have an impact on society.	7.ESS.6.a.1 Research common synthetic materials (i.e. plastics, composites, polyester, and alloys) to gain an understanding that synthetic materials do come from natural resources and have an impact on society.
7.ESS.7 Describe the positive and negative environmental impacts of obtaining and utilizing various renewable and nonrenewable energy resources in Indiana. Determine which energy resources are the most beneficial and efficient.	7.ESS.7.a.1 Describe the positive and negative environmental impacts of obtaining and utilizing various renewable and nonrenewable energy resources in Indiana.
	7.ESS.7.a.2 Determine which energy resources are the most beneficial and efficient.

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Life Science (LS)	Content Connector
7.LS.1 Investigate and observe cells in living organisms and collect evidence showing that living things are made of cells. Compare and provide examples of prokaryotic and eukaryotic organisms. Identify the characteristics of living things.	7.LS.1.a.1 Identify the characteristics of living things.
	7.LS.1.a.2 Investigate and observe cells in living organisms and collect evidence showing that living things are made of cells.
	7.LS.1.a.3 Compare and provide examples of prokaryotic and eukaryotic organisms.
7.LS.2 Create a model to show how the cells in multicellular organisms repeatedly divide to make more cells for growth and repair as a result of mitosis. Explain how mitosis is related to cancer.	7.LS.2.a.1 Create a model to show how the cells in multicellular organisms repeatedly divide to make more cells for growth and repair as a result of mitosis.
	7.LS.2.a.2 Explain how mitosis is related to cancer.
7.LS.3 Explain how cells develop through differentiation into specialized tissues and organs in multicellular organisms.	7.LS.3.a.1 Explain how cells develop through differentiation into specialized tissues and organs in multicellular organisms.
7.LS.4 Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	7.LS.4.a.1 Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.
7.LS.5 Compare and contrast the form and function of the organelles found in plant and animal cells.	7.LS.5.a.1 Compare and contrast the form and function of the organelles found in plant cells.
	7.LS.5.a.2 Compare and contrast the form and function of the organelles found in animal cells.

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Engineering (E)	Content Connector
6-8.E.1 Identify the criteria and constraints of a design to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	6-8.E.1.a.1 Identify the criteria and constraints of a design to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
6-8.E.2 Evaluate competing design solutions using a systematic process to identify how well they meet the criteria and constraints of the problem.	
6-8.E.3 Analyze data from investigations to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	
6-8.E.4 Develop a prototype to generate data for repeated investigations and modify a proposed object, tool, or process such that an optimal design can be achieved.	